Toxics

Teacher's Introduction to Toxics

Toxics Released Into Our Environment are a Growing Public Concern

Toxics are poisonous substances that cause harm to living things. Toxicity occurs when enough of the substance is present to cause an effect in a living organism or system. The term generally refers to chemicals or wastes that are undesirable to be exposed to. It is very difficult to assess the impact of toxic pollutants released into our environment due to many factors. However, we can assume it is better to avoid exposure to toxics as much as possible.

Public awareness and concern about toxic chemicals have dramatically increased during recent years. This concern and public pressure are encouraging some industries to look for ways to reduce toxic releases from their facilities. Some facilities have made significant efforts to reduce releases and have achieved a great deal of success. The public is also beginning to seek out non-toxic and less toxic products.

Millions of pounds of toxic chemicals are released into our land, air, and water each year. Large manufacturing companies have been required to report these releases to the state since 1987. In addition, many smaller sources also release toxics but they are not required to report these releases at this time.

Most of the toxics reported by industries were released in 13 Kentucky counties. The impact of these chemicals on human health and the environment is largely unknown. However, 32% of these releases and transfers are known or suspected to cause cancer in humans.

The activities in this section will enable you and your students to become more informed about toxics released into Kentucky's environment. Activities are designed to encourage students to reduce their personal consumption of toxic products and to work constructively within their school and community to reduce the use of toxic substances.

ν Where to Get Information

The "State of Kentucky's Environment" report contains information about industrial emissions, including the amount released in each county. Efforts to reduce emissions are also discussed, as well as risk assessment, exposure to lead in homes, and other issues. Check the index in the report for general information and the expanded index in the appendix of this guide to find a list of all the references to your county and region.

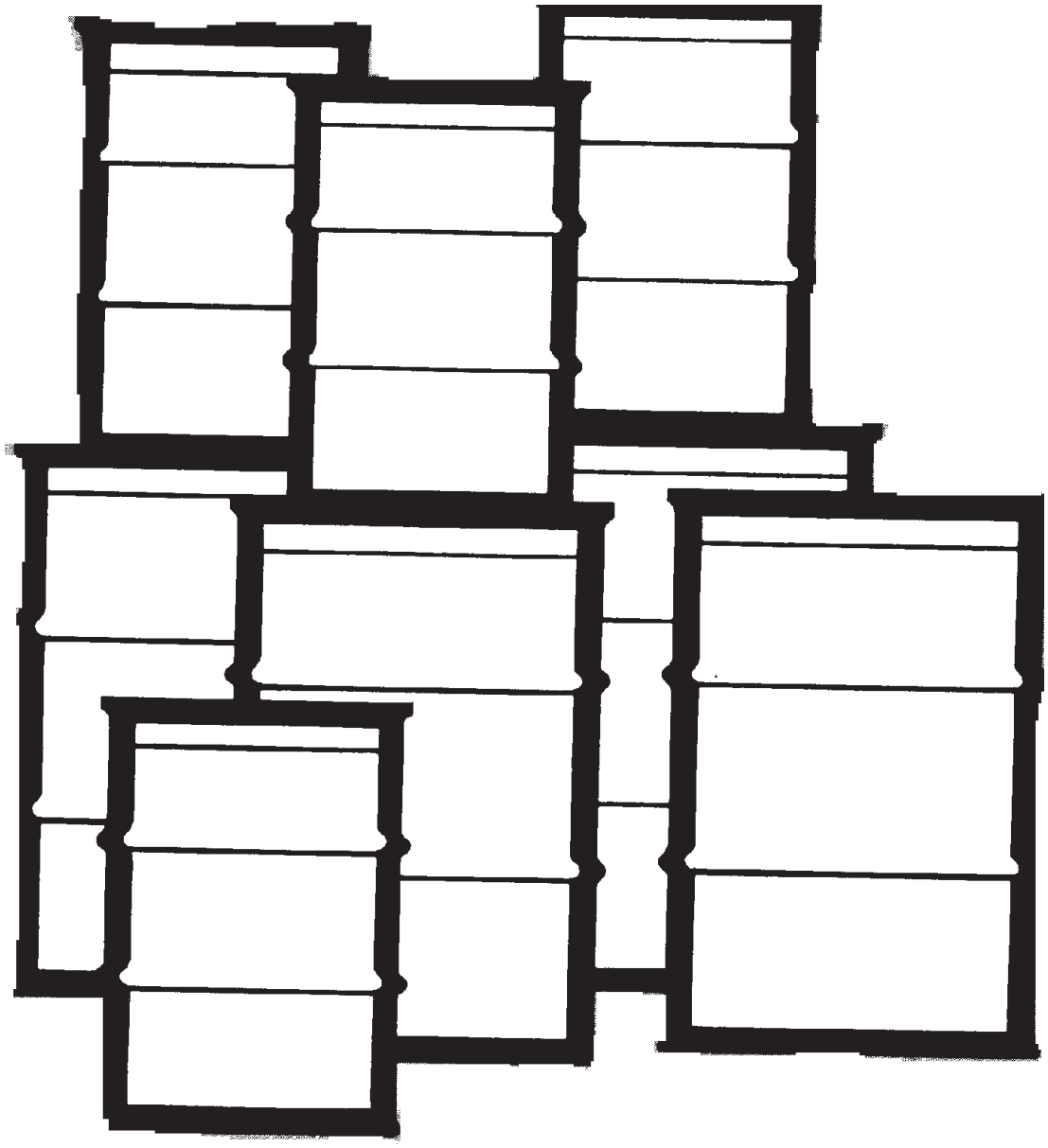
ϖβ Overview of Student Activities

Activity 1: Toxics in Your Community: Part of the Story

In this activity, students will assess toxic releases in Kentucky and their community. They will also evaluate statewide trends in toxic releases and discover how toxic chemicals and wastes are managed and disposed.

Activity 2: Toxics in Your Community: The Rest of the Story

Students will take an important step in solving the problems of toxic chemicals by reducing their personal consumption of toxic products after conducting an inventory of toxics used in their homes and school.



Activity 1. Toxics in Your Community: Part of the Story

Instruction Sheet

DO YOU KNOW. . .

- How many pounds of toxic chemicals are released each year into your community by large manufacturing companies?
- How the amount of toxics released in your county compares to the amount released in other Kentucky counties?

Congress Mandates Industries to Report Toxic Releases to the Public

In 1986, Congress passed a federal law requiring certain large companies which release toxic pollutants into the environment to report these releases to the public. This law was passed, in part, as a result of the tragedy that occurred in Bhopal, India, where thousands of people were killed and injured when toxic gases escaped from the Union Carbide chemical plant there.

Shortly after that incident, and another accidental release of chemicals that frightened a West Virginia community, the public demanded the right to be informed about toxic chemicals released and stored in their communities. Public concern has prompted some companies that emit toxics to reduce the amount released into the environment. However, much more needs to be done to reduce the toxic chemical releases and their impact to the environment.

Purpose:

Kentuckians now have an opportunity to assess toxics releases both statewide and in each community. In this activity you will learn about toxic chemicals released in Kentucky and your community and consider their impacts on the environment and public health. You will evaluate statewide trends in toxic emissions and discover how toxics are disposed and managed.

Procedure:

Part I - Investigating Toxic Releases in Kentucky

1. Obtain Worksheet #1 from your teacher. Review, discuss, and answer questions.

Part II - Toxics in Your Community

1. As a class, track the toxic releases for your county for each year reporting has been required (1987-1991) and report them in your school newspaper or on a school display. To determine the releases in your community, contact the Kentucky Department for Environmental Protection, Toxics Inventory Office, 14 Reilly Rd., Frankfort, Kentucky 40601, 502-564-2150, and request information for the industrial facilities in your county that are required to report toxic releases. Ask for information for each year reporting has been required.
2. Prepare a report about toxic releases in Kentucky and your community. Graph the amount of releases for each year. Discuss your findings and develop recommendations to control toxic releases in your community.

Phase III - Encouraging Toxic Reductions

1. Invite a representative from one of the industries in your community that has reported toxic releases to discuss the company's efforts to reduce them. Discuss your findings and recommendations with them.

Other Activities:

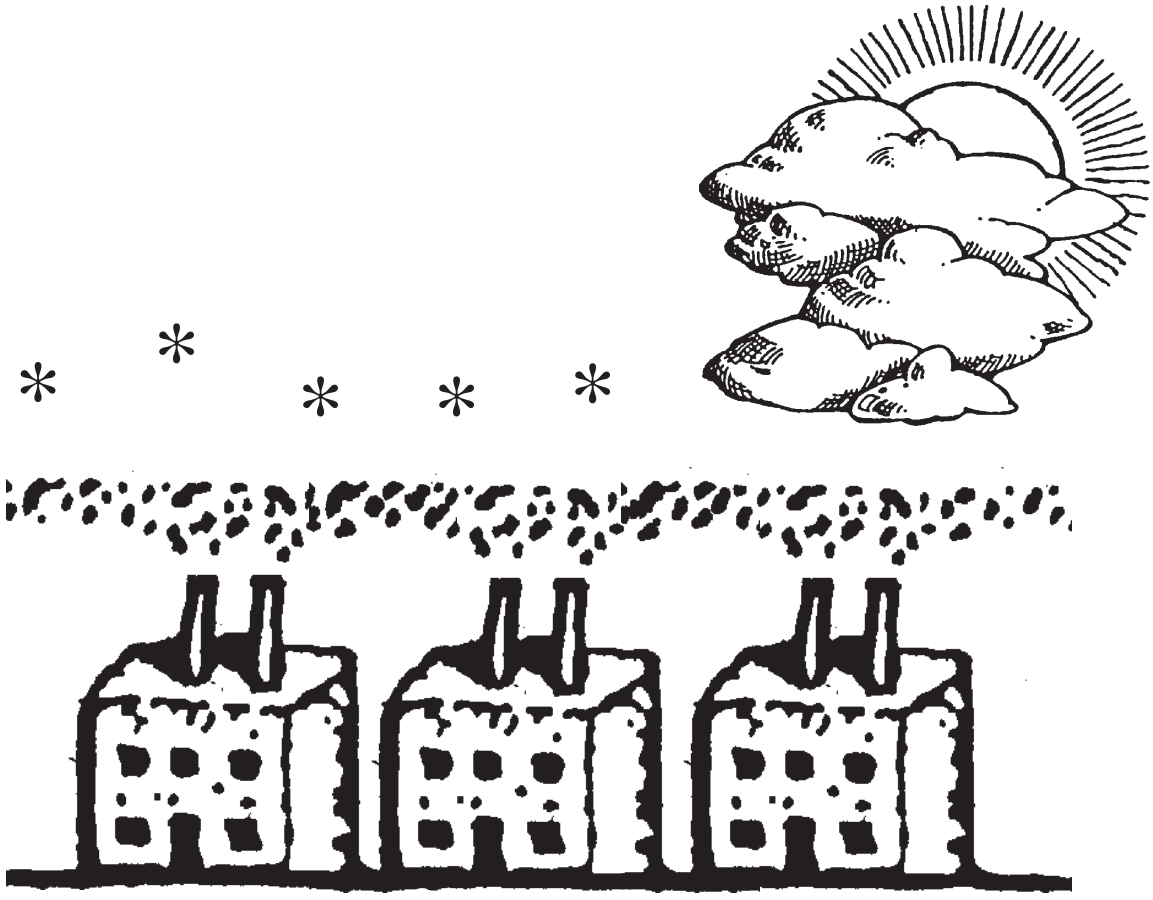
1. As a class, write an article about toxic releases for your school newspaper. Include graphics, etc. and suggest what students can do to help reduce toxics in the environment.
2. Write a letter to the editor of your local newspaper about the importance of reducing toxic chemical releases.
3. Research the topic "Pollution Prevention" and learn about future career opportunities in this field.

Instructions continued

4. Research why Congress passed the federal "Community Right to Know Act" which gave you the "right" to know about toxic releases in your community.

References/Additional Resources:

1. Each county has a local emergency planning committee that inventories hazardous and toxic substances stored and used in your community. Contact the Kentucky Division of Disaster and Emergency Services, Technical Services Branch, 502-564-5223, to locate your local committee and to find out what they are doing.
2. Call the National SARA Title III Hotline, toll free at 1-800-535-0202, for more information regarding a particular toxic chemical.
3. Teachers: The Kentucky Division of Waste Management has available a teacher's guide entitled "Waste: A Hidden Resource in Kentucky," that contains additional learning activities on the subject of toxic chemicals and other issues. Contact the Division's Public Education Coordinator, Division of Waste Management, 14 Reilly Rd. Frankfort, KY., 502-564-6716 for more information.



Activity 1. Toxics in Your Community: Part of the Story
Worksheet #1

Citizens Work to Reduce Toxic Releases in Their Community

When a chemical company proposed to locate a new plant in Glasgow, Kentucky the residents of the city opposed it due to concerns about the toxic chemicals it would be releasing into the environment.

Although the company would employ many local residents, its operations would also result in the release of volatile organic chemicals, which are generally unhealthy to breathe and are known to harm the ozone layer. But the citizens of Glasgow decided to work with the company to reach an agreement that would limit the toxic releases to much lower levels than originally proposed.

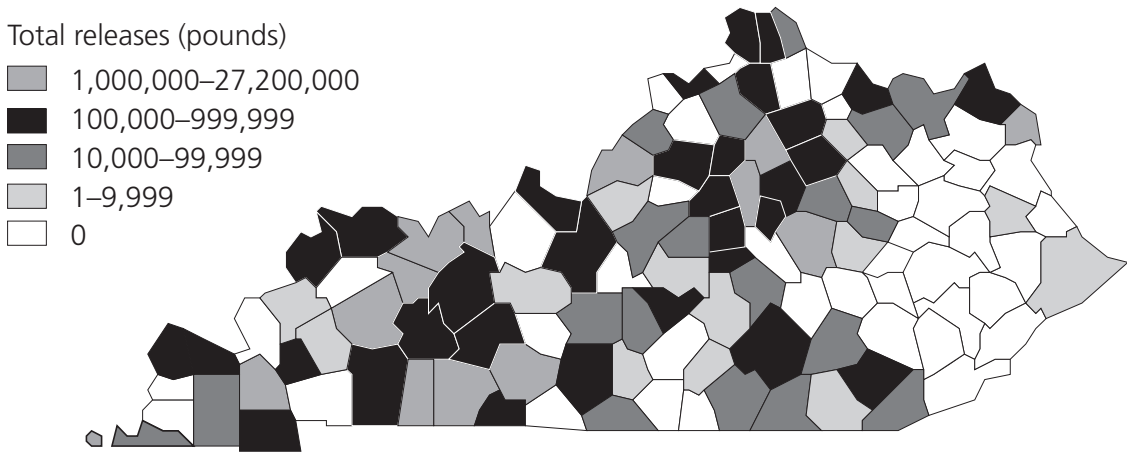
As a result of the citizens action and the company's interest in being a "good neighbor," toxic releases will be limited to 50 tons per year and will not exceed 150 tons per year regardless of how much the plant expands in the future. The company also committed to spending at least $500,000 on additional controls to lower its toxic releases and will take other steps to reduce pollution beyond what is required by state law.

Although some in the community are still concerned about the impact the plant may have on the environment there is a greater sense of assurance among residents. They expect to continue working with the company to keep their local environment as clean as possible. The Glasgow story is a good example of the success that can be achieved in creating new jobs while at the same time minimizing environmental problems through a cooperative effort involving all parties.

Toxics Released Throughout Kentucky, Most Emitted in 13 Counties

In 1990, 78.8 million pounds of toxic chemicals were reported released into Kentucky's environment or transferred for further waste management. Approximately 80% of all toxics released in 1990 were emitted in 13 counties - Jefferson, Marshall, McLean, Boyd, Woodford, Hancock, Scott, Logan, Warren, Daviess, Todd, Madison, and Hopkins. These counties received toxic releases ranging from one million to more than 27 million pounds (Figure 1).

Figure 1
Industrial Toxic Releases to Land, Air, and Water in Kentucky (1990)



Source: Kentucky Department for Environmental Protection, Toxic Chemical Release Inventory Data, 1990

Worksheet #1 continued

The amount of toxics reported released by industries in Kentucky in 1990 was 34.5% less than the 120.3 million pounds reported in 1988 (Figure 2). The decrease in reported releases is due to better understanding of reporting requirements, more accurate reporting, a trend among industries to avoid using reportable chemicals, and reductions achieved through manufacturing process changes. These totals do not include the toxics released by many smaller sources including that are not required to report releases, or that result from transportation spills.

Highly Toxic Chemicals Targeted for Reduction

Many of the toxic releases reported by industries involve chemicals that are known or suspected to cause cancer and other serious health effects. Of the 112.4 million pounds of toxics released in Kentucky during 1989, 26.8 million pounds were among 17 chemicals that have been targeted by the federal government for reduction because they are highly toxic. In 1990, 25 million pounds of the reported releases and transfers in Kentucky were considered highly toxic or known or suspected carcinogens.

Figure 2

Top 25 Kentucky Industrial Facilities with Toxic Releases/Transfers

Company	County	(State Ranking) and Total Pounds 1989	1990
Dupont	Jefferson	(1) 40,213,058	(1) 10,554,142
Barmet Aluminum	McLean	(2) 6,851,181	(2) 7,693,050
American Synthetic Rubber	Jefferson	(4) 5,443,330	(3) 5,292,197
Air Products and Chemicals	Marshall	(3) 5,591,750	(4) 4,914,127
Westlake Monomers	Marshall	*	(5) 4,123,511
Armco Steel	Boyd	(8) 1,972,653	(6) 2,328,755
GTE Products	Woodford	(7) 2,387,813	(7) 2,279,531
Hi–Tek Polymers	Jefferson	(12 1,498,792	(8) 2,189,562
Toyota Motor	Scott	(15) 1,261,840	(9) 2,126,465
Rohm & Haas	Jefferson	(44) 358,857	(10) 1,325,882
Commonwealth Aluminum	Hancock	(11) 1,700,380	(11) 1,315,416
GE Appliances	Jefferson	(14) 1,451,150	(12) 1,180,178
E.R. Carpenter	Logan	(16) 1,080,210	(13) 1,164,205
Koppers Industries	Todd	(260) 4,056	(14) 1,138,931
Standard Gravure	Jefferson	(13) 1,489,500	(15) 1,052,250
Imco Recycling	Butler	(168) 30,135	(16) 992,250
Akzo Coatings	Jefferson	(30) 531,427	(17) 846,069
Armco Steel - Coke Plant	Boyd	(22) 782,271	(18) 820,740
Ensign–Bickford	Muhlenberg	(23) 725,800	(19) 761,005
General Motors	Warren	(32) 482,442	(20) 729,945
Ahlstrom Filtration	Hopkins	(26) 664,942	(21) 728,382
ISP Chemicals	Marshall	(17) 953,197	(22) 680,085
Ashland Petroleum	Boyd	(19) 877,002	(23) 649,612
Dow Corning	Carroll	(18) 887,486	(24) 642,874
Brown Printing Co.	Simpson	(36) 449,203	(25) 631,023
Total 25	**15**	**77,688,475**	**56,160,187**

Source: Kentucky Department for Environmental Protection, Toxic Chemical Release Inventory Data, 1988-90.

Worksheet #1 continued

Disposal of Toxics Changes in Recent Years

There are six ways in which toxics are released into the environment: into the air, discharges to streams, on-the site where it was generated, injected underground, discharges to wastewater treatment plants, and off-site transfers to other facilities for treatment or disposal (Figure 3). Statewide, about 50% of the toxics released into the environment are emitted into the air.

On-site toxic releases decreased from 5.4 million pounds in 1988 to 1.2 million pounds in 1990. This decline was attributed to the closure of man-made ponds, known as impoundments, previously used to dispose hazardous wastes, and a shift to sending these materials off-site rather than landfilling them on the site where they were generated.

The decrease in toxics discharged into Kentucky streams, from 1.7 million pounds in 1988 to 736,679 pounds in 1990, was largely due to more accurate reporting. Several facilities reported discharges during 1988 that should not have been reported. The 1989 and 1990 data reflect this correction.

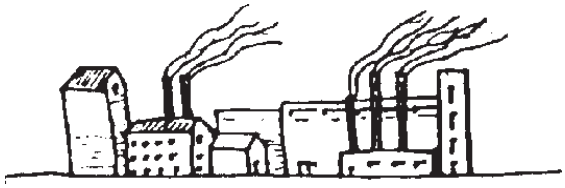


Figure 3

Toxics Released by Reporting Industries to Land, Air, and Water in Kentucky

Releases/Transfers (pounds)	1988[1]	1989	1990[2]
Total Air Emissions	47,203,709	44,879,849	41,461,167
Stream Discharges	1,701,027	791,963	736,679
Total On–Site[3]	5,492,005	646,414	1,203,265
Underground Injection	30,000,000	39,000,000	9,447,843
Transfers for Further Waste Management			
Municipal WWTPs[4]	2,778,294	2,605,736	2,319,401
Off–Site Transfers	33,109,298	24,469,556	23,639,723
Total Reported	**120,284,333**	**112,393,518**	**78,808,069**
Number of Reporting Facilities	**335**	**368**	**400**

[1]1988 data do not include aluminum oxide and sodium hydroxide solution (total 40 million lbs.) which were delisted for 1989.
[2]1990 data include 1.16 million pounds of toxic chemicals that were not previously required to be reported.
[3]On-site includes landfills, pits, ponds, lagoons, and other methods used for storage or final disposal of toxic substances.
[4]Industrial wastewater discharges transferred to municipal wastewater treatment plants.
Source: Kentucky Department for Environmental Protection Toxic Chemical Release Inventory Data,1988-90.

Worksheet #1 continued

Pollution Prevention Programs Could Help Reduce Emissions

A promising approach to control toxic pollutants is to not create them in the first place. There is increasing emphasis being placed on preventing pollution by using less-toxic or non-toxic substances. The public and government agencies are encouraging companies that release toxic chemicals, especially those that are highly toxic and cancer causing, to reduce their releases to the lowest possible levels. Some industries, like the one in Glasgow, are taking the "pollution prevention" approach seriously as a way to reduce toxics at their facilities.

A number of Kentucky industries are participating in the federal government's "33/50 Program." Companies participating in the program voluntarily agreed to reduce toxic releases 33% by 1992 and 50% by 1995. Some companies have already made major reductions and expect to do even more. However, only nine of the top 25 companies that release toxics in Kentucky have committed to participate in the program during 1992.

Reducing toxics can be expensive for a facility because it may require an initial investment in new machinery or process materials. But most companies that make the investment report overall savings in the long run because they become more efficient and pay less to dispose their waste.

It is important for all of us to consider ways to reduce our use of toxic products and substitute them for "environmentally friendly" ones whenever possible. We should also work with our local businesses to find ways to reduce potentially harmful toxics in our communities (Figure 3).

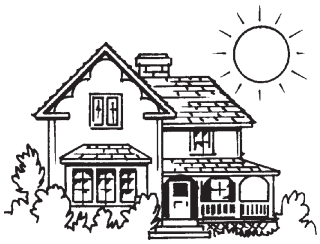
Questions?

1. Choose a county in Figure 1 that receives greater and lesser amounts of toxic chemical releases than your county. What might account for the differences between your county and the others?
2. Which company in Figure 2 had the greatest percentage of toxic reductions between 1989 and 1990? Which had the least?
3. Describe what toxics are, how they are typically released, and what information is available regarding releases in your community.
4. Which types of releases in Figure 3 do you think have the greatest potential to impact people? Which appears to have the least? Explain your answer.

What You Can Do...

1. Monitor the toxic releases in your community and become active in encouraging reductions at local industries, like the Glasgow residents did.
2. Read the label of all the products you purchase. Try to replace toxic products with "environmentally friendly" ones.

Activity 2. Toxics in Your Community: The Rest of the Story
Instruction Sheet



DO YOU KNOW:

How toxic products used in your home and school can impact the environment?

What you can do to reduce toxics in your community?

Home Toxics Cause Environmental Problems, Alternatives Available

People are more likely to be exposed to toxic chemicals in their homes and businesses than anywhere else. Many of the products we commonly use such as cleaners, bleach, paints, pesticides and lawn care chemicals contain toxic chemicals that are potentially harmful to our health and the environment.

Toxic chemicals can enter rivers and streams when they run off the land or are washed down the drain. Chemical vapors from solvents, paint, gasoline, and other substances can pollute the air during use of the these products.

While we may think using a paint thinner does not result in any noticeable problems, the toxic solvents released from this product combined with releases from the manufacture and use of many other chemical products does add up. The impact of toxic chemicals is becoming increasingly noticeable in Kentucky's environment. For example the state has warned the public not to eat catfish and white bass from 780 miles of rivers and streams due to toxic contamination found in the fish.

Greater awareness of the impact of these toxic products has led some consumers to begin to reduce their use and demand less toxic substitutes. In many cases, toxic products can be replaced with non-toxic alternatives that often cost less and are better for the environment. Non-toxic products are getting easier to find because many retailers are now stocking them due to consumer demand.

However, the general public has been slow to switch to non-toxic alternatives. We should all become more familiar with the products we use and find "environmentally friendly" alternatives. Products that are toxic are labeled "toxic or harmful" and should be replaced by those that are not toxic or ones that are less toxic.

Purpose:

This activity will allow you to become more familiar about the toxics you use and the impact everyday household products may have on the environment. You will conduct a survey of toxic products in your home and investigate alternatives. The activity provides you an opportunity to take an important step in solving the problems of toxic chemicals by reducing your personal use of toxic products.

Procedure:

Part I - Home Toxics Survey

1. Obtain Worksheet #1 from your teacher and survey your home for toxic products. Good places to look for toxic products include under the kitchen sink, in the bathroom, basement, workshed, and garage.
2. Research non-toxic products that can be substituted for commonly used toxic ones. Some examples of common alternatives include: baking soda or borax replaces comet cleanser and bleach, vinegar instead of ammonia-based window cleaners, and cedar chips rather than moth balls.
3. Visit a grocery store or other stores to review their selection of non-toxic alternatives.

Part II - Going a Step Further

1 Review and compare the home surveys in class.
2. Discuss the following issues as a class or in groups:
   - A. Reasons why people might not want to substitute "environmentally friendly" products for toxic ones.
   - B. Reasons why the manufacturers of toxic products continue to produce them.
   - C. How the toxic products we use end up in the environment.
   - D. Whether or not we should have laws requiring all products to be as non-toxic as possible and what the benefits/problems of the requirements might be.
   - E. How to encourage people to use non-toxic products.

Instructions continued

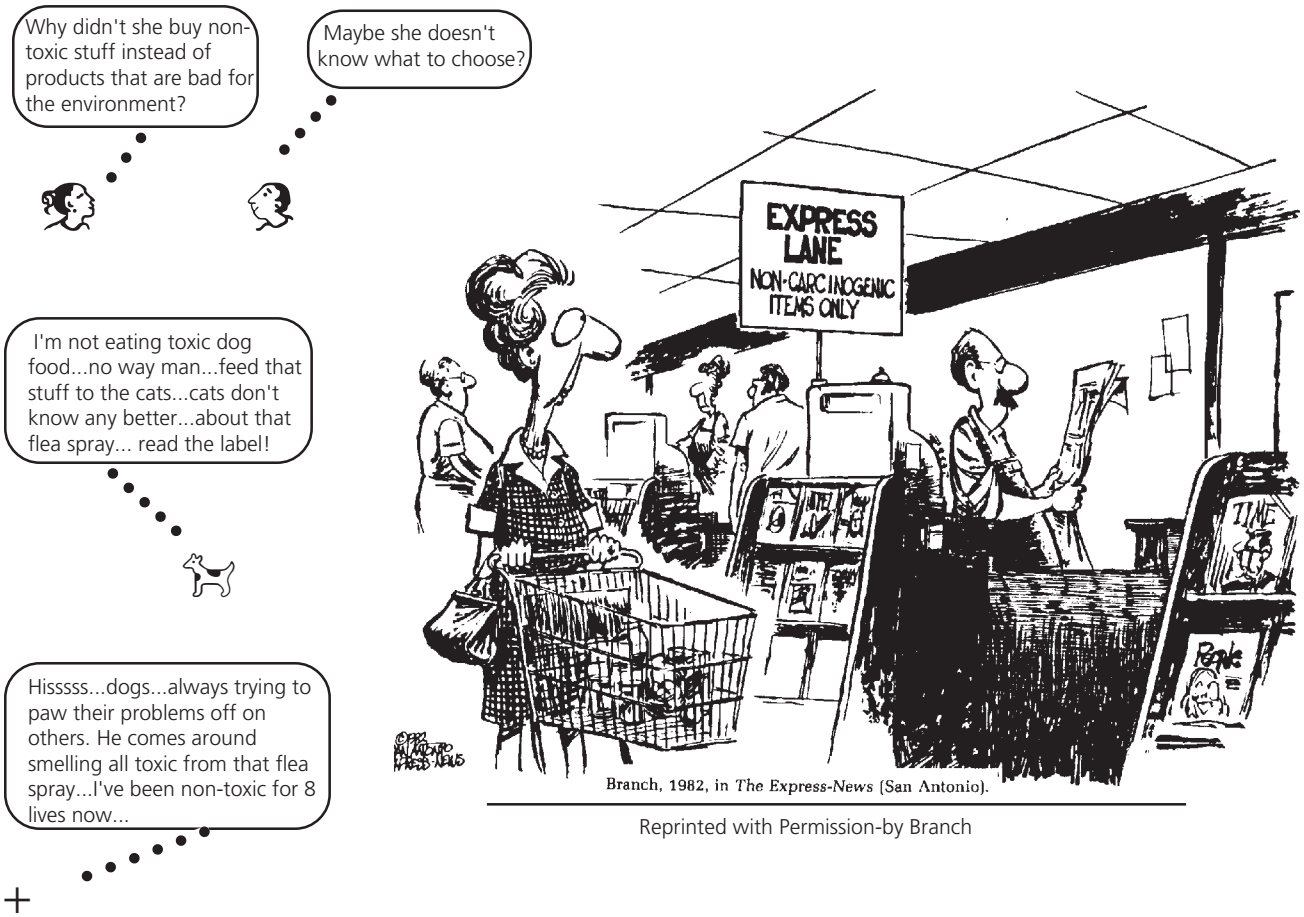
3. As a class, prepare a list of common toxic products used in the home and "environmentally friendly" substitutes. Create a display or flyer to share the results with your schoolmates, family, and friends.
4. Discuss your research with your parents and ask if they would be willing to try the alternative products. Follow up with discussions, additional research, or demonstrations of the "environmentally friendly" products.

Other Activities:

Develop an educational campaign to build awareness in your school about the benefits of using "environmentally friendly" products.

References/Additional Resources:

1. Local extension offices have a listing of non-toxic products that can be used as substitutes for toxic ones we use everyday. Check the telephone book under county listings for your local extension office phone number.
2. Teacher's: The Kentucky Division of Waste Management has available a teacher's guide entitled "Waste: A Hidden Resource in Kentucky," that contains additional learning activities on the subject of toxic chemicals and other issues. Contact the Division's Public Education Coordinator at the Division of Waste Management, 14 Reilly Rd., Frankfort, Ky. 40601, 502-564-6716 for more information.



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Activity 2. Toxics in Your Community: The Rest of the Story
Worksheet #1

Activity 2. Toxics in Your Community: The Rest of the Story
Worksheet #1

Home Toxics Survey

Product	Toxic (y/n)	Harmful Effect	Cost	Non-Toxic Alternative	Cost	Will Use (yes/no) Comments

What You Can Do. . .

1. Dispose of household products carefully. Never pour paints, brush cleaners, or other toxic products down the drain. Sewers and septic tanks cannot treat these materials and they will eventually be released into the enviornment. Buy the product with the least amount of toxic materials. Used turpentine and brush cleaners can be filtered and reused. Stuff paint cans and other chemical containers with newspapers before discarding.

Home Toxics Survey

Product	Toxic (yes/no)	Harmful Effect	Cost	Non-Toxic Alternative	Cost	Will Use (yes/no) Comments

What You Can Do (continued). . .

2. Contain chemical spills quickly. If pesticides, oil, or similar products spill onto your garage floor or other hard surfaces, do not wash down the area. This will further contaminateand carry the material to storm drains and other water sources. Surround the contaminates with soil, sawdust, kitty litter, or some other absorbent material. Put the material in a strong plastic bag and put the bag in the trash. Large spills may need to be reported to the state.

3. A quart of oil can pollute thousands of gallons of water. Take your used motor oil to an oil recycling center or gas station that will accept this material.